Stoller
Hanford Office

DOE-EM/GJ798-2005

C4557
Log Data Report

Borehole Information:

Borehole: C4557			Site: 216-S-7 Crib		
Coordinates (WA St Plane)		GWL[1] (ft) : 331.1		GWL Date:	
North	East	Drill Date	Ground Level Elevation	Total Depth (ft)	Type
Not available	Not available	12/04	Not available	224	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded steel	1.2	10 1/2	9 3/4	3/8	+1.2	112
Threaded steel	1.9	8 3/4	7 1/2	5/8	+1.9	224

Borehole Notes:

The driller and logging engineer measured the inside and outside diameters for the 10-in. and 8-in. casings, respectively, using a steel tape. Ground-level elevation was not available. Logging data acquisition is referenced to the ground surface. During the logging conducted on 12/27/2004, the area was designated as a contaminated area (CA).

Spectral Gamma Logging System (SGLS) Equipment Information:

Logging System:	Gamma 1E		Type:	SGLS (70%) SN: 34TP40587A
Calibration Date:	10/04	Calibration Reference:	DOE-EM/GJ770-2004	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Logging System:	Gamma 4E		Type:	SGLS (70%) SN: 34TP40587A
Calibration Date:	05/04	Calibration Reference:	DOE/EM-GJ692-2004	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

High Rate Logging System (HRLS) Equipment Information:

Logging System:	Gamma 1C		Type:	HRLS SN: 39-A314
Calibration Date:	05/04	Calibration Reference:	DOE-EM/GJ713-2004	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4 Repeat	5
Date	12/07/04	12/07/04	12/07/04	12/07/04	12/29/04
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	0.0	16.0	33.0	101.0	225.0
Finish Depth (ft)	17.0	34.0	112.0	111.0	111.0
Count Time (sec)	100	20	100	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A[2]	N/A	N/A	N/A	N/A
Pre-Verification	AE034CAB	AE034CAB	AE034CAB	AE034CAB	DE551CAB
Start File	AE034000	AE034018	AE034037	AE034117	DE551000
Finish File	AE034017	AE034036	AE034116	AE034127	DE551114
Post-Verification	AE034CAA	AE034CAA	AE034CAA	AE034CAA	DE551CAA
Depth Return Error (in.)	N/A	N/A	N/A	-1	N/A
Comments	No fine-gain adjustment	High rate interval; dead time > 40%	No fine-gain adjustment	No fine-gain adjustment	No fine-gain adjustment

Log Run	6 Repeat				
Date	12/29/04				
Logging Engineer	Spatz				
Start Depth (ft)	127.0				
Finish Depth (ft)	115.0				
Count Time (sec)	100				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	1.0				
ft/min	N/A				
Pre-Verification	DE551CAB				
Start File	DE551115				
Finish File	DE551127				
Post-Verification	DE551CAA				
Depth Return Error (in.)	- 2				
Comments	No fine-gain adjustment				

High Rate Logging System (HRLS) Log Run Information:

Log Run	7	8	9	10 Repeat	
Date	01/11/05	01/11/05	01/11/05	01/11/05	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	16.0	17.0	27.0	22.0	
Finish Depth (ft)	18.0	28.0	33.0	26.0	
Count Time (sec)	300	100	300	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	AC116CAB	AC116CAB	AC116CAB	AC116CAB	
Start File	AC116000	AC116003	AC116015	AC116022	
Finish File	AC116002	AC116014	AC116021	AC116026	
Post-Verification	AC116CAA	AC116CAA	AC116CAA	AC116CAA	

Log Run	7	8	9	10 Repeat	
Depth Return Error (in.)	N/A	N/A	N/A	N/A	
Comments	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	No fine gain adjustment	

Logging Operation Notes:

The 10-in. casing was contaminated on the inside during drilling and it is reported that grease applied to the threaded joints may have been contaminated. Logging was performed with a plastic sleeve over the sonde. The centralizer was attached on the outside of the sleeve. Logging was conducted on December 7, 2004 (log runs 1-4), December 29, 2004 (log runs 5 and 6), and January 11, 2005 (log runs 7-10). Three logging systems were used. These systems are referred to as SGLS 1E (four log runs), SGLS 4E (two log runs), and HRLS 1C (four log runs). Measurements were acquired with each system in a single casing string. Logging was conducted with a centralizer on each sonde. Measurements are referenced to ground surface. Repeat sections were collected in this borehole for all systems to evaluate the logging system's performance.

Analysis Notes:

Analyst:	Henwood	Date:	01/20/05	Reference:	GJO-HGLP 1.6.3, Rev. 0

Pre- and post-run verifications for the logging systems were performed before and after data acquisition. Acceptance criteria were met for all systems.

A casing correction for 3/8-in.-thick casing (10-in. casing) was applied to the spectral log data (SGLS and HRLS) from 0 to 112 ft. From 112 to 225 ft, a correction for 5/8-in. thick casing (8-in. casing) was applied to the SGLS data.

SGLS and HRLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL worksheet templates identified as G1EOct04.xls and G4EJul04 for the two SGLSs and G1CMay04.xls for the HRLS using efficiency functions and corrections for casing, water, and dead time as determined from annual calibrations. Dead-time corrections are applied where dead times exceed 6.4, 4.7, and 10.8 percent for G1E, G4E, and G1C, respectively. Where SGLS dead time exceeds 40 percent, HRLS data are substituted. No correction for water was necessary.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (^{137}Cs) detected in the borehole, naturally occurring radionuclides (^{40}K, ^{238}U, ^{232}Th [KUT]), a combination of man-made, KUT, and total gamma plotted with dead time. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead-time correction, casing corrections, or water corrections. Repeat log sections are also included where appropriate.

Results and Interpretations:

^{137}Cs was detected in this borehole between the ground surface and 128 ft. The maximum concentration was measured at approximately 2 million pCi/g at 25 ft in depth. The highest concentration zone lays between 15 and 35 ft. Because the inside of the 10-in. casing was contaminated to 112 ft, this assay may overestimate the true concentration. The ^{137}Cs contamination at low concentrations observed between 112 and 128 ft may be the result of dragging down contamination on the outside of the 8-in. casing from higher depth intervals.

The naturally occurring ^{238}U exhibits a relatively higher concentration throughout the borehole than normally observed. This higher concentration is probably the result of enhanced radon.

The repeat sections for the SGLS and HRLS indicate good agreement.

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[1] GWL – groundwater level
[2] N/A – not applicable

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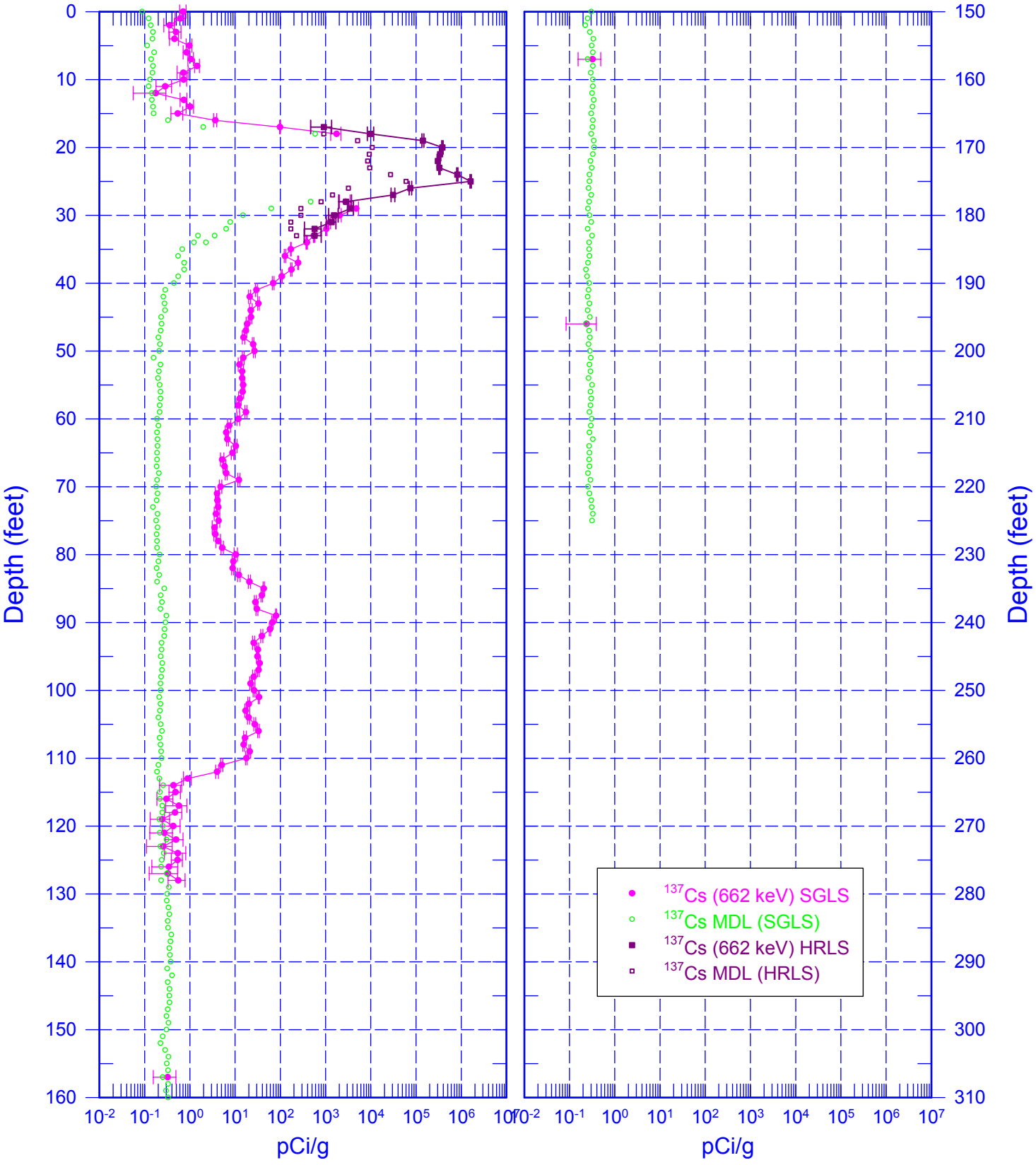
Man-Made Radionuclides



Zero Reference = Ground Surface

Depth Scale: 1"=20 ft

Last Log Date - 01/11/05

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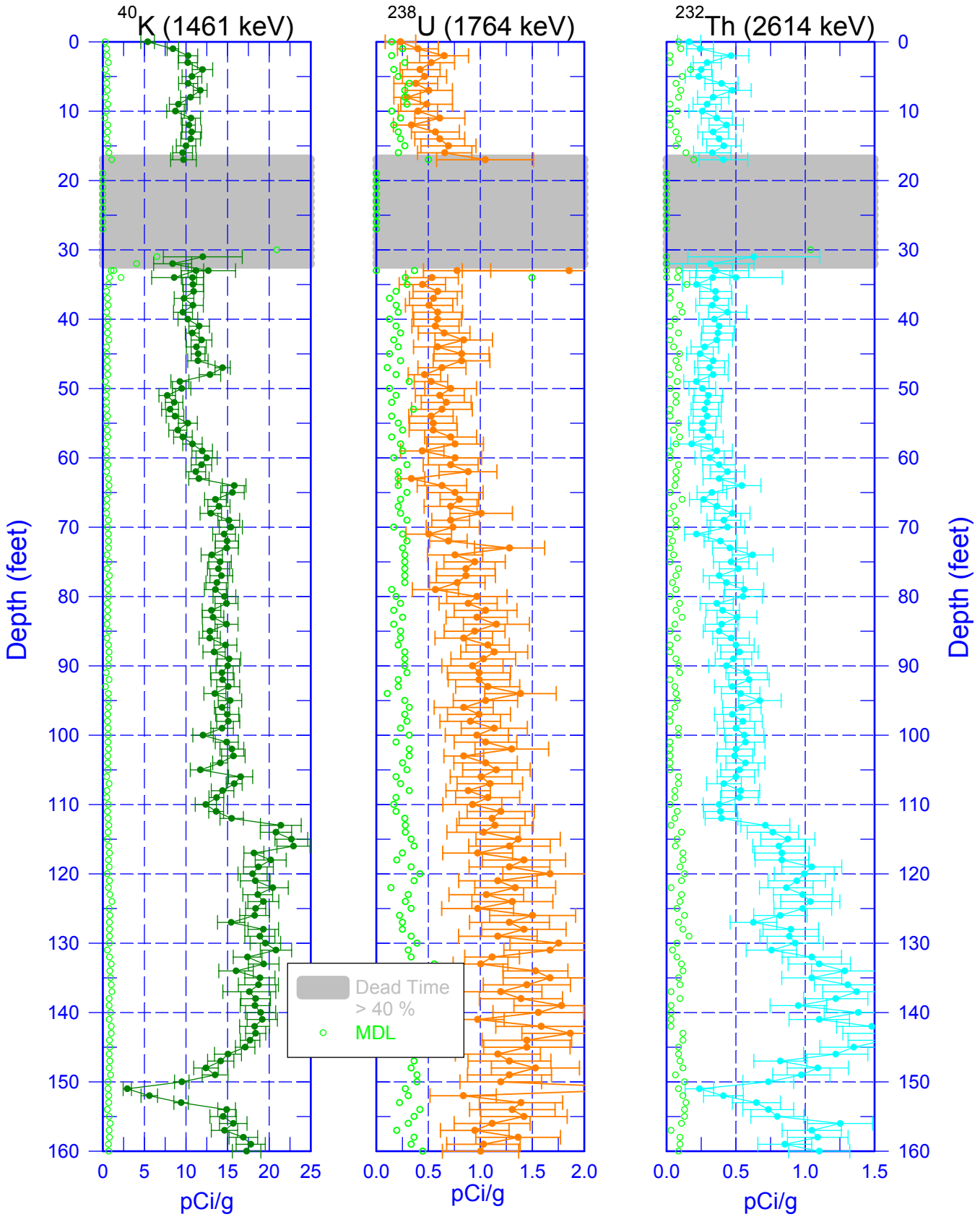
Natural Gamma Logs

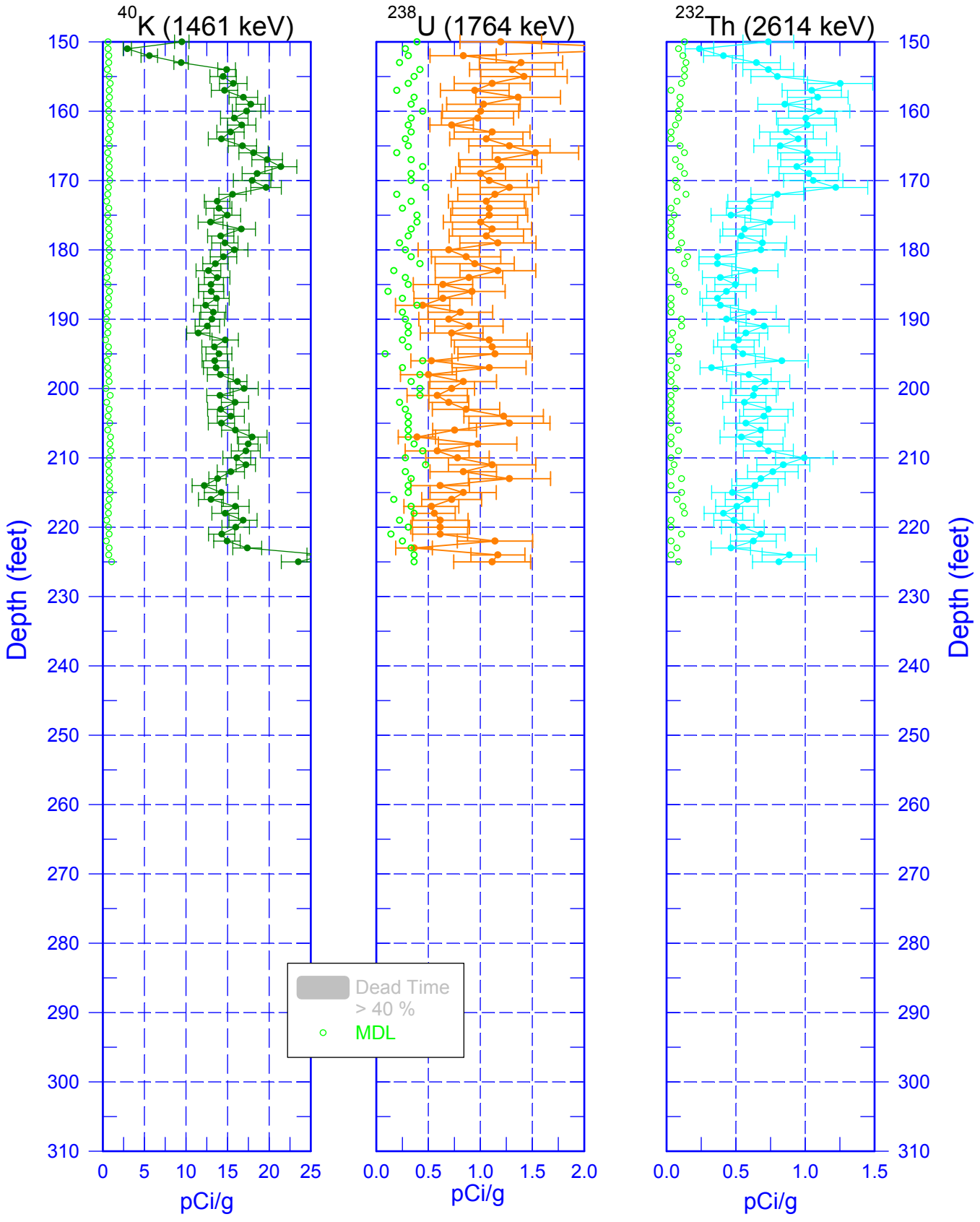


Zero Reference = Ground Surface

Depth Scale = 1" = 20 ft

Last Log Date - 01/11/05

C4557
Natural Gamma Logs

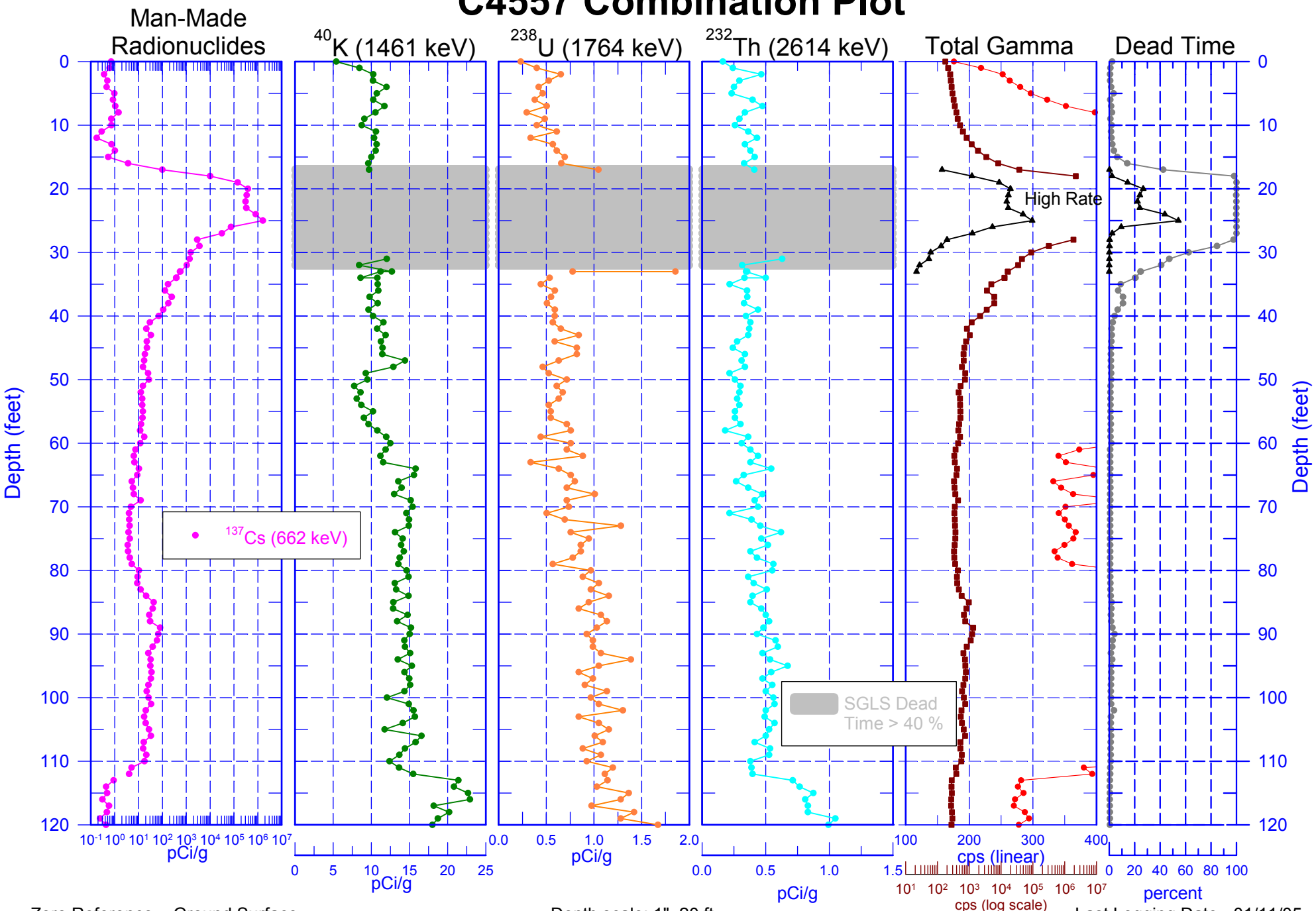


Zero Reference = Ground Surface

Depth Scale = 1" = 20 ft

Last Log Date - 01/11/05

C4557 Combination Plot

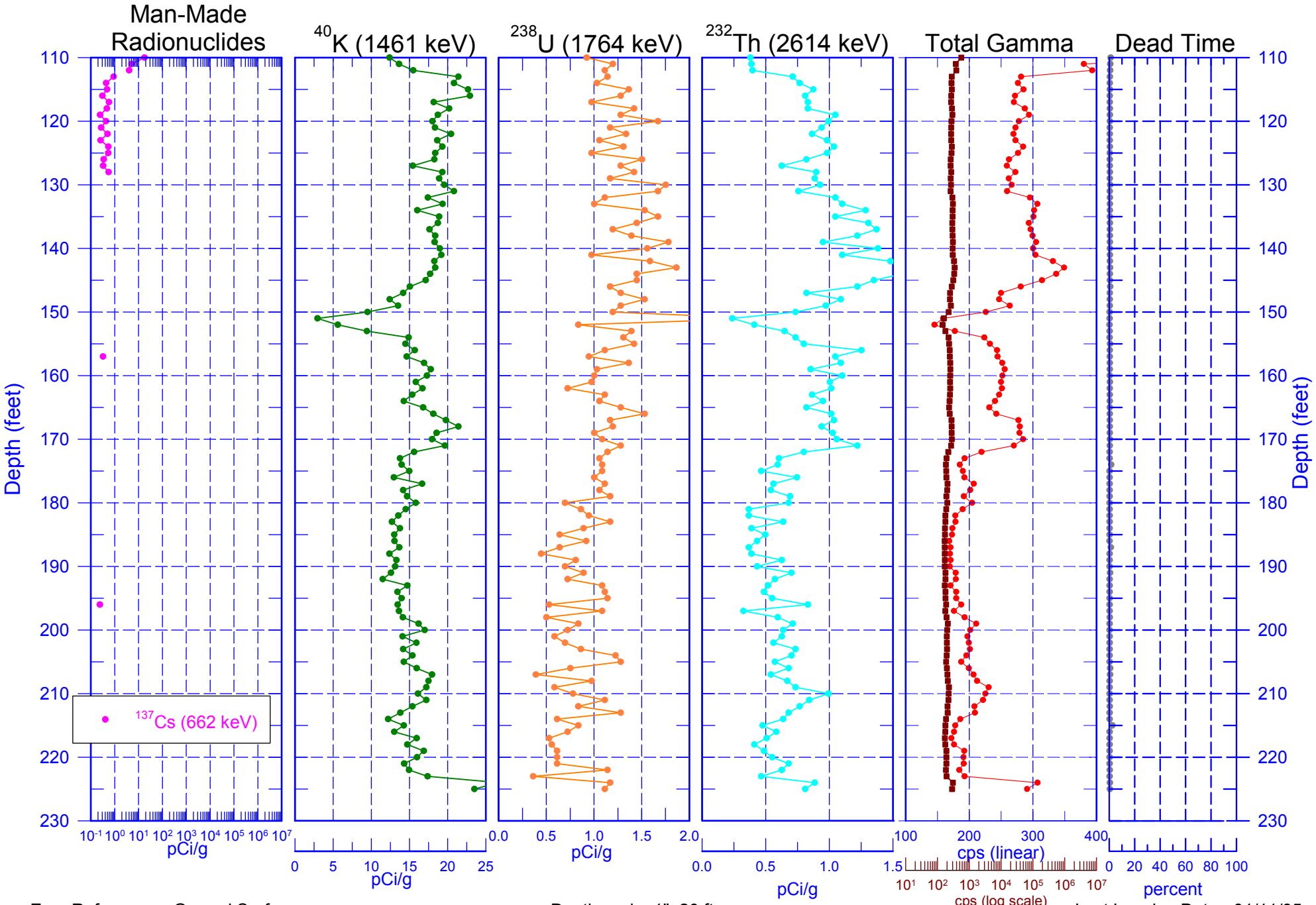


Zero Reference = Ground Surface

Depth scale: 1"=20 ft

Last Logging Date - 01/11/05

C4557 Combination Plot



Zero Reference = Ground Surface

Depth scale: 1"=20 ft

Last Logging Date - 01/11/05

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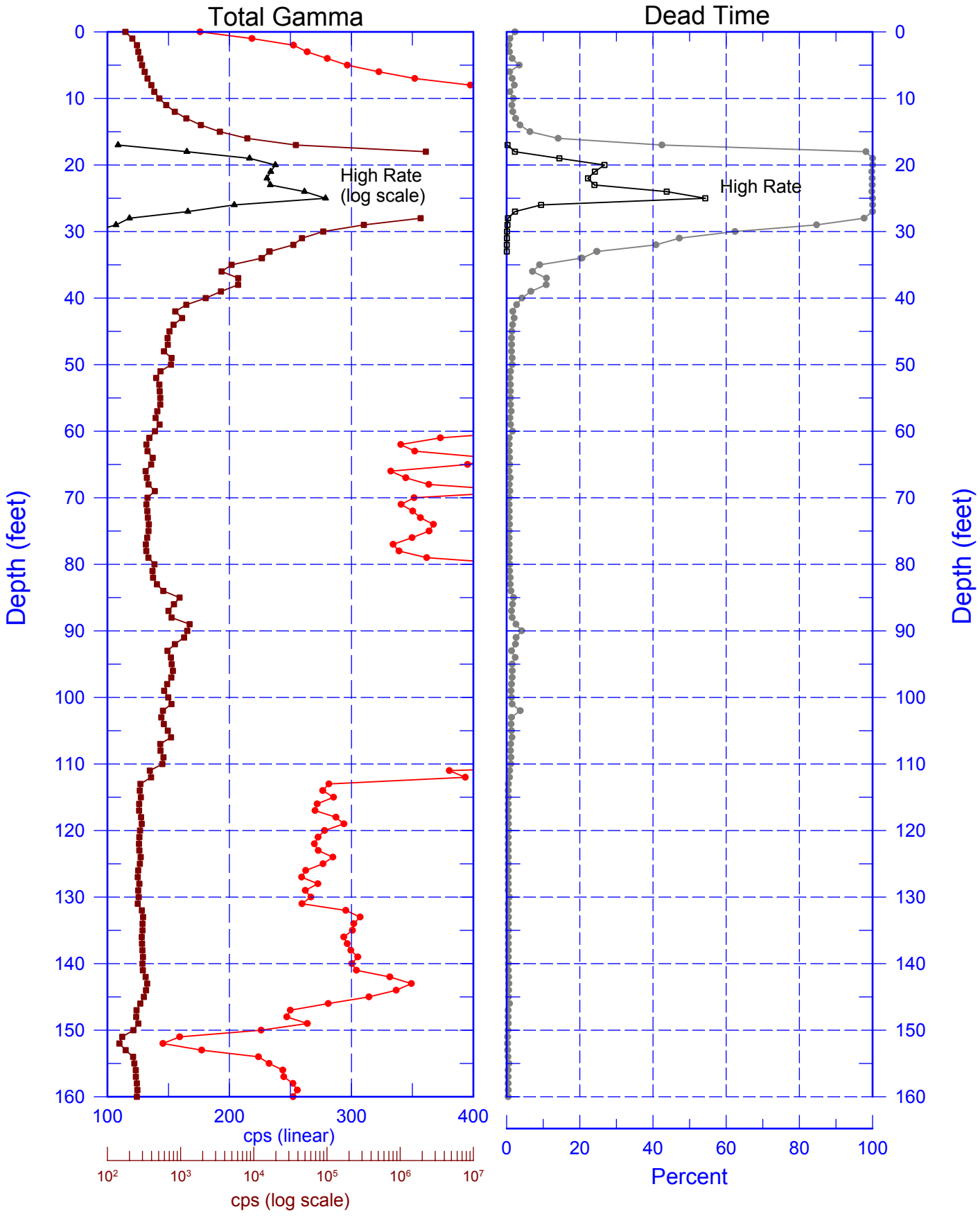
Total Gamma & Dead Time

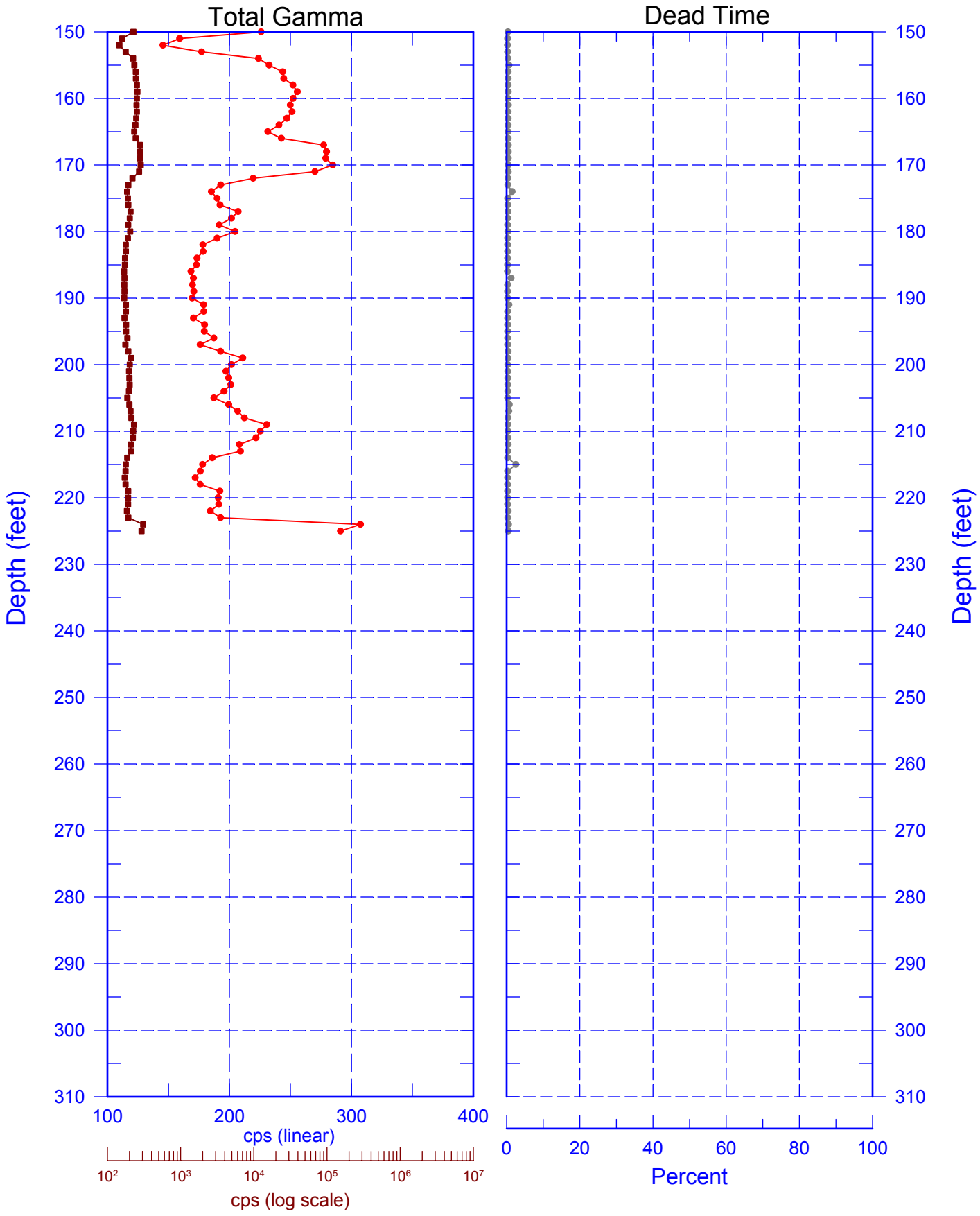


Depth scale:1"=20 ft

Reference - Ground Surface

Last Log Date - 01/11/05

C4557
Total Gamma & Dead Time



Depth scale:1"=20 ft

Reference - Ground Surface

Last Log Date - 01/11/05

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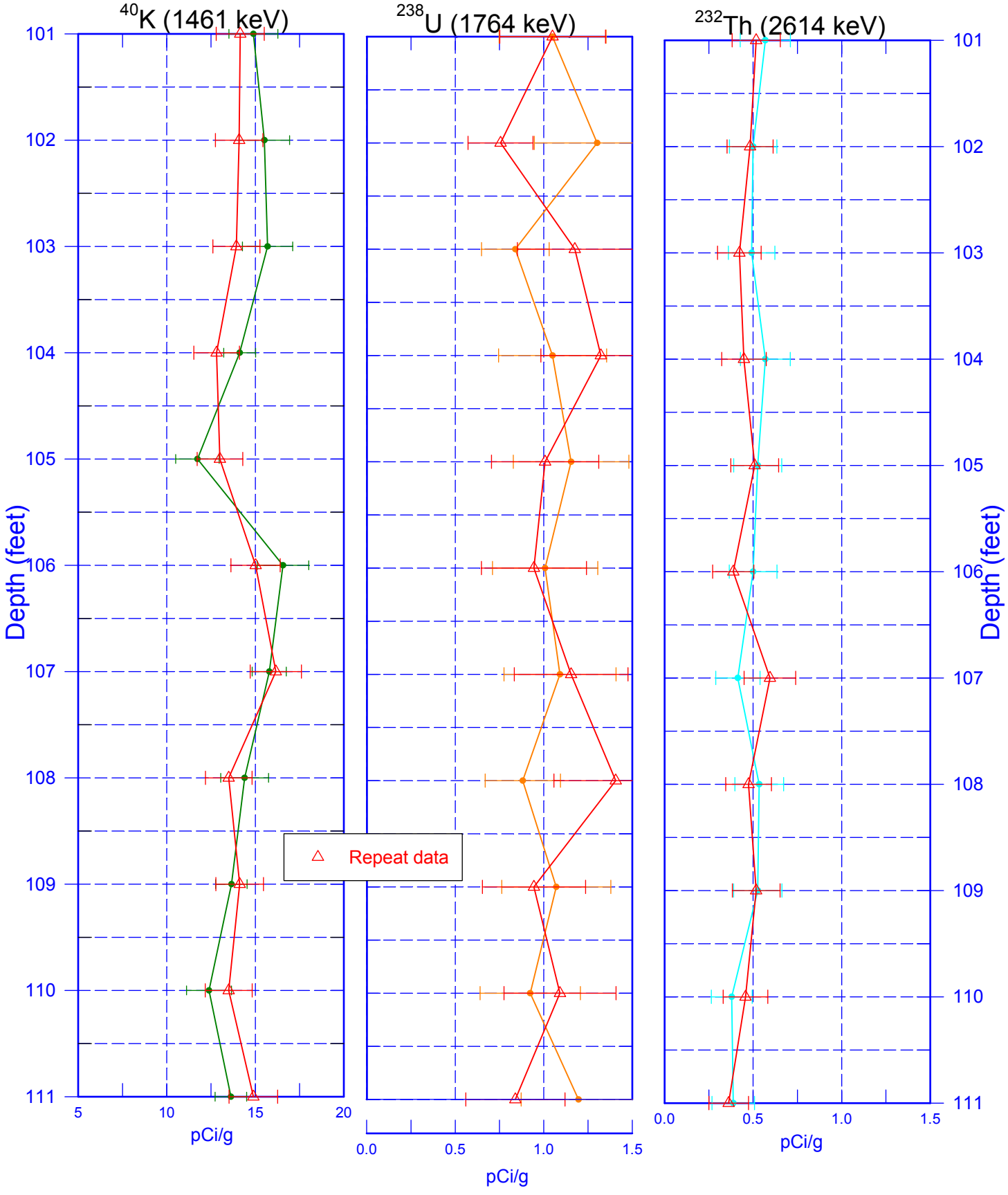
Repeat Section of Natural Gamma Logs

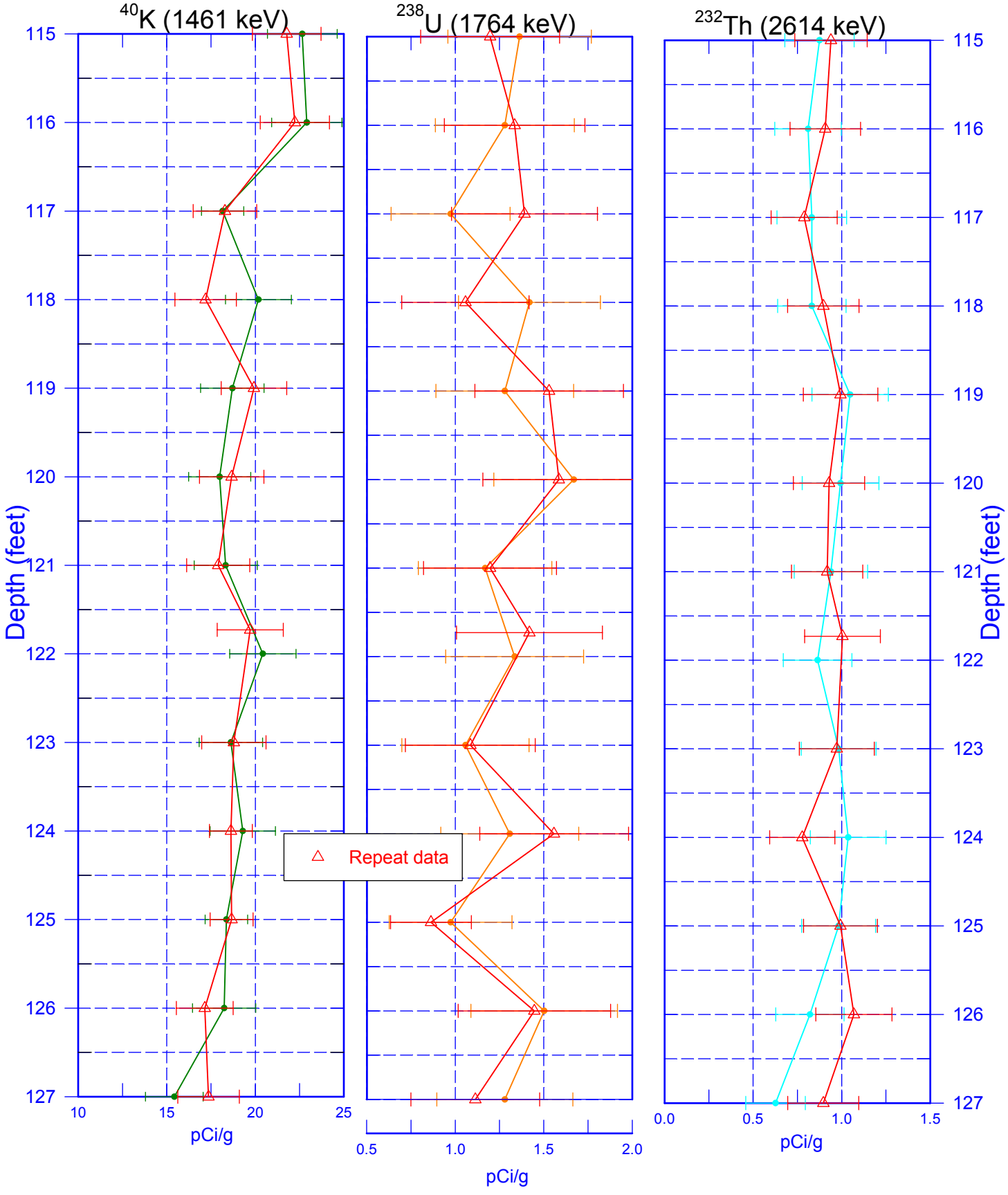


Zero Reference = Ground Surface

Last Log Date - 01/11/05

C4557

Repeat Section of Natural Gamma Logs



Zero Reference = Ground Surface

Last Log Date - 01/11/05

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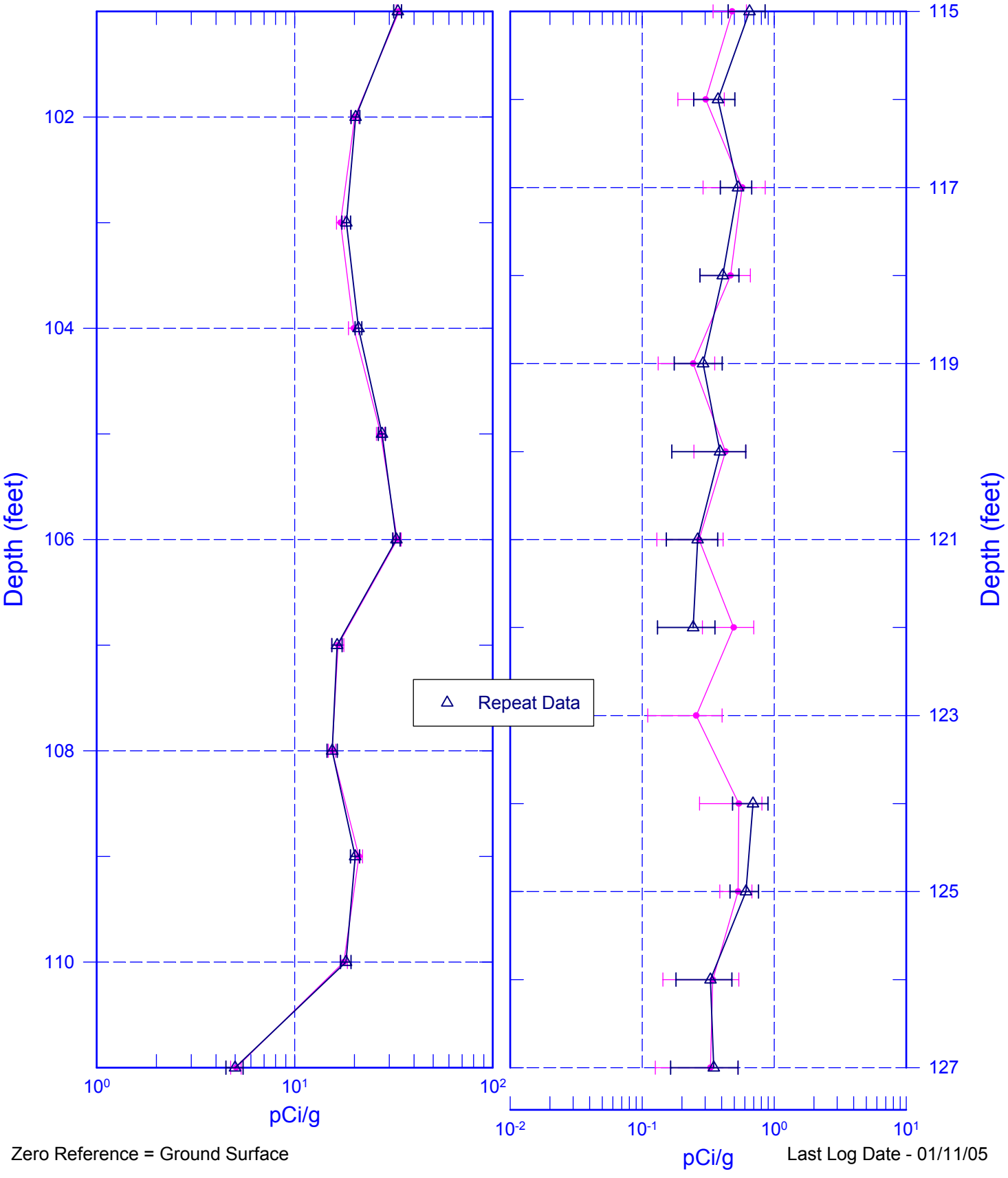
^{137}Cs SGLS Repeat Data



Zero Reference = Ground Surface

Last Log Date - 01/11/05

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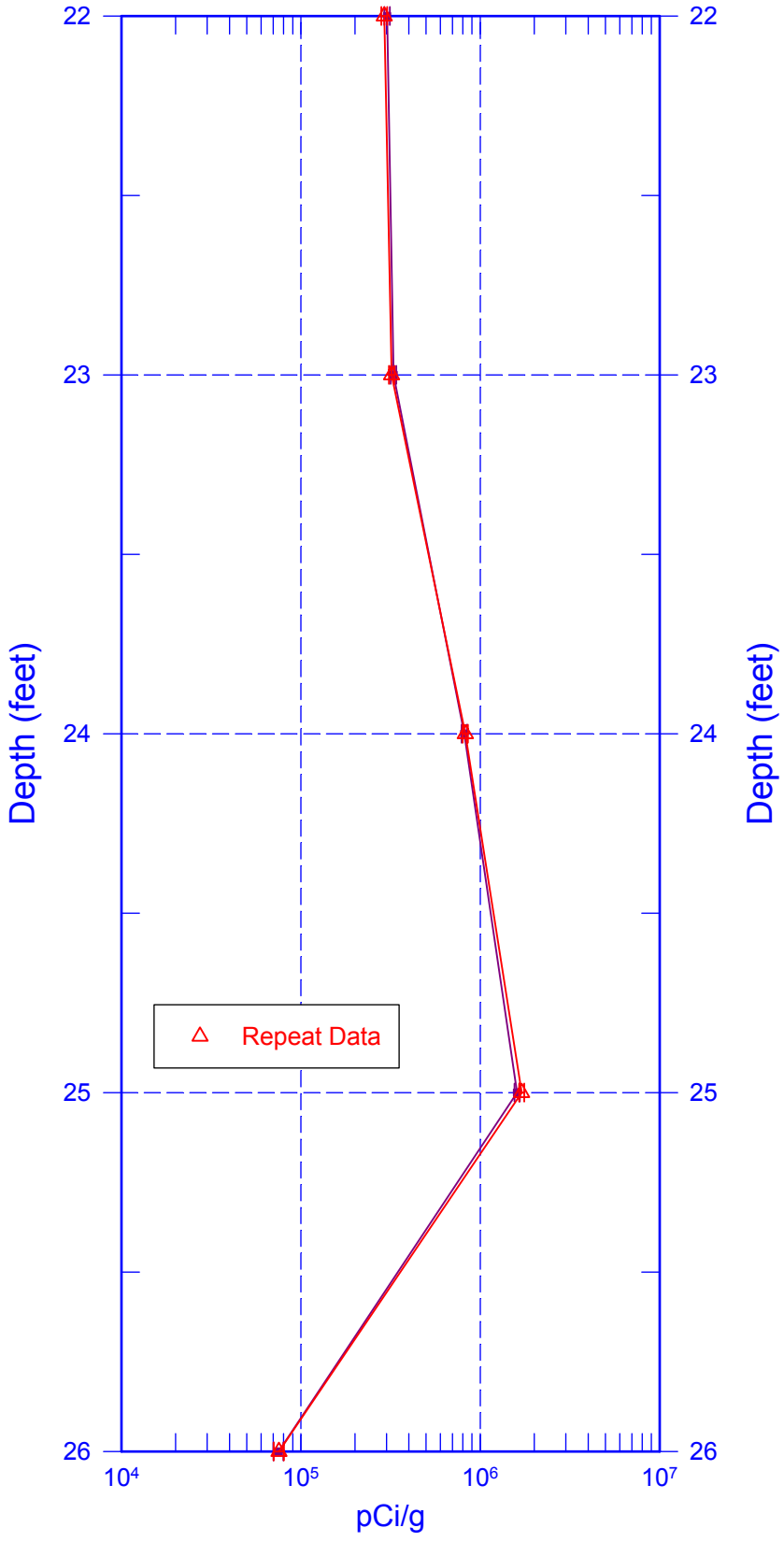
^{137}Cs High Rate Repeat Section



Zero Reference = Ground Surface

Last Log Date - 01/11/05